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DESCRIPTIONS OF THREE NEW SPECIES OF CALCEOLIDÆ FROM THE  
UPPER SILURIAN ROCKS OF KENTUCKY.

BY VICTOR W. LYON.

For several years past there have been found in the ferruginous clay and light-gray marly limestone of the Niagara period, which outcrops at the quarries in Jefferson County, Kentucky, on Beargrass Creek, one mile east of Louisville, many fossils, which have been considered by some collectors to be a species of coral allied to *Zaphrentis*

Until November 25th, 1877, all the specimens which I found were in such a state of preservation that they could not be determined.

Since my attention has been called particularly to these specimens, I have collected one hundred and seventy well-preserved fossils, which I regard as true *Calceolæ*. There are four distinct species, of which three are new.

In the same bed, associated with these new forms of *Calceola*, are found *Calceola Tennesseensis* (Roemer); *Orthis elegantula*, *O. hybrida*, *O. nisis*, *O. rugæ plicata*; *Spirifer radiata*, *S. crispus*, *S. rostellum*; *Pentamerus nysius*, *P. Littoni*, *P. Knappi*, *P. nucleus*; *Rhynchonella Saffordi*, *R. Tennesseensis*, *R. neglecta*; *Cyrtia exporrecta*; *Caryocrinus ornatus*; *Eucalyptocrinus cælatulus*, *E. crassus*; *Haplocrinus ovalis*, etc. The new species referred to are as follows:—

Genus **CALCEOLA**, Lamarck, 1801.

*Calceola corniculum*, V. W. Lyon, n. sp.

Shell thin; valves not articulated; ventral valve horn-shaped; area high and narrow, greatly curved to the left, flat, one inch along the shorter curve, from apex to hinge; hinge straight, four-tenths inch long, at an obtuse angle to the apex.

Draw a line from the centre of the hinge perpendicularly, and it will cut the longer curve of the area midway between apex and hinge.<sup>1</sup>

<sup>1</sup> I have before me two very perfect ventral valves of *C. Tennesseensis*, from Decatur County, Tenn., Upper Silurian. Shell triangular pyramidal, area one inch from apex to hinge; hinge line one inch wide.

If a line be drawn from cardinal process to apex, it will divide the shell

Dorsal side of ventral valve sub-semicircular, markings of growth indistinct, parallel to sub-semicircular opening; dorsal side of opening almost perpendicular to hinge line, or about one-tenth inch nearer to the apex.

Cardinal process or tooth central, round and smooth along its summit, three-tenths inch in length, three-tenths in width, gradually narrowing from the hinge backward, extending from the hinge line to the inner end of cavity.

The characters which separate this species from *C. Tennesseeensis*, Roemer, and *C. sandalinæ*, Lamarck, are well marked. The semicircular margin of the mouth in *C. Tennesseeensis* is one-half inch from the apex; while in *C. corniculum* it is nine-tenths inch, or almost over the hinge line.

*Position and Locality*.—A few good ventral valves have been obtained from the ferruginous clay, Niagara period, one mile east of Louisville, north side of Beargrass Creek.

*Calceola Coxii*,<sup>1</sup> V. W. Lyon, n. sp.

Shell thick, triangular, valves not articulated; ventral valve pyramidal; area large, flat, triangular, nine-tenths inch high, with an obscure central line; markings of growth prominent, extending around the shell parallel to hinge; hinge line straight crenulated, four-tenths inch long.

Mouth semicircular; cavity three-tenths inch deep; all around the mouth, extending centrally towards the bottom of cavity, are linear rows of punctures, not so conspicuous as in those of the European species, *C. sandalina*. The cardinal process central, prominent, short, round, and smooth along its summit.

Dorsal valve raised slightly, sub-centrally toward hinge line; valve composed of several thin semicircular plates, one above another, gradually increasing in diameter from top to bottom; area very narrow. Cardinal process not seen.

In some adult species young are seen attached to the bottom of cavity; none have been found on the outside of shell, as in *C. attenuatus*.

*Position and Locality*.—In same beds as the preceding, also in

into two right-angle triangles. The hinge is at right angles to the apex; while in *C. corniculum* the hinge is at an obtuse angle.

<sup>1</sup> I take great pleasure in dedicating this elegant *Calceola* to Prof. E. T. Cox, State Geologist of Indiana.

marly limestone of Niagara period, north side Beargrass Creek, one mile east of Louisville, Jefferson County, Ky.

I have two excellent specimens with both valves united; also ten good ventral valves of this species.

*Calceola attenuatus*, V. W. Lyon, n. sp.

Shell thick, attenuated, valves not articulated; area of ventral valve high and narrow, curving to the right, then to the left, then to the right (some have three curves, others only two); area straight part of the distance from the aperture toward the apex, then curving gradually upward and outward (some specimens have two curves upward, others one); area two inches high, with an obscure central line; hinge three-tenths inch wide, straight.

Markings of growth in some specimens very prominent, also striæ extending around the shell, parallel to the semicircular opening or mouth. One of the most remarkable features of this species is, that along the outer edge, and sometimes the central line of the area, at almost each line of growth, and also in one or two specimens at the mouth of the shell, are one or more processes or small bodies having the appearance of foot-stalks. Some of them are one-tenth inch in length, others four-tenths. At first I thought these processes had served merely to attach the shell to some permanent body; but after cleaning one very large and elegant specimen, I discovered these processes to be young *Calceolæ*, showing all the distinct features of the older one.

In one young ventral valve, which is attached to the second line of growth of an adult, the cardinal process or tooth is perfect.

Another most singular feature in the adult of this species is, that in two places the central line of the area is lifted at the line of growth, and the cardinal process is seen at each. This specimen has the appearance as if three adults had almost swallowed each other, leaving only the hinge lines and tooth visible. Cardinal process three-tenths inch long, from two to three lines wide, round and smooth along its summit, gradually diminishing in width towards its end, not reaching the end of the cavity. In some specimens the process is larger and longer than above indicated, but it never reaches the bottom of the cavity as in *C. corniculum*. The characters of this species are so well marked that it can be distinguished at a glance from any known species of *Calceola*.

*Position and Locality.*—I have sixty good ventral valves from the ferruginous clay and marly limestone of the Niagara period, one mile east of Louisville, Ky., north side of Beargrass Creek.

I have no doubt that the young of *C. attenuatus* and of all other species of the *Calceolidæ* became attached immediately after germination, to the inner surface of the rim of the mouth, and remained in this position until they were large enough to support themselves. Lines of growth upon these species are nothing more or less than the margins of former mouths, which are almost always obliterated in very old adults, but in one instance two of these old mouths are seen, showing the hinge, also the central cardinal process, as well as the new one, within all of these mouths, are seen young specimens of *Calceola* attached, having the general characters of the adult. In two instances one of the vigorous young attached itself to the bottom of the cavity and eventually killed the old one, and then took complete possession.

I have one specimen of *C. attenuatus* two inches long (ventral valve), three-tenths inch wide at hinge, within the cavity of which stands another *Calceola* of the same species one and a half inch long, three-tenths inch at hinge; the apex of smaller is attached to the bottom of the cavity of the larger, and almost fills it; the cardinal process of larger is seen.